Faculty Working Papers

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IN CAPITAL ASSET PRICING:
A COMPLEMENTARY ANALYSIS

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MARKET INFORMATION VS. ACCOUNTING INFORMATION IN CAPITAL ASSET PRICING: A COMPLEMENTARY ANALYSIS

by

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ABSTRACT

Based upon an efficient estimator model for capital asset pricing, the importance of accounting information in capital asset pricing is empirically demonstrated. The sales maximization vs. profit maximization issue is also empirically examined.

MARKET INFORMATION VS. ACCOUNTING INFORMATION IN CAPITAL ASSET PRICING: A COMPLEMENTARY ANALYSIS

I. Introduction

The importance of accounting information on security price determination is of interest to both security analysts and accountants. Beaver (1972), Downes and Dyckman (1973), Gonedes (1973), Beaver and Manegold (1975) and others have investigated several relationships between accounting information and market information. Rosenberg (1974) has shown the existence of extra-market components of covariance in security returns while Simkowitz and Logue [S-L] (1973) have derived the interdependent structure of security returns. However, none of this research has explicitly investigated how the empirical results can be affected by alternative accounting income measures within a simultaneous equation system.

The main purposes of this paper are to investigate the impact of different measures for "firm related variables" on security price determination and to analyze these implications for the measurement and utilization of accounting data. The model used in this empirical study is a simultaneous equation model developed by Lee and Vinso [L-V] (1976). In the second section, the model used in this paper is specified and the justification for using the L-V model instead of either the Sharpe model, the S-L model or the Rosenberg model is explored. In the third section, annual financial data of the 35 largest industries are used to

test the impact of different measures for "firm related variables" on security price determination. Some implications of measurements and utilization of accounting data are developed from the empirical results. Finally, the results of this paper are summarized and some concluding remarks are presented.

II. The Model

Following Lee and Vinso [L-V] (1976), the basic model used in this empirical study can be defined as:

(1) $$R_{jt} = a_j + \beta_j R_m + b_{j1} X_{j1t} + b_{j2} X_{j2t} + b_{j3} X_{j3t} + \varepsilon_{jt}$$

Where R_{jt} = the return on the j^{th} security over time interval t in a group classified by a reasonable classification scheme, $(j = 1, 2, \ldots, I_k)$, $(t = 1, 2, \ldots, T)$

R_{mt} = the return on a market index over time interval t,

X_{j1t} = the profitability index of j^{th} firm over time interval t, $(j = 1, 2, \ldots, I_k)$

X_{j2t} = the leverage index of j^{th} firm over time period t, $(j = 1, 2, \ldots, I_k)$, $(t = 1, 2, \ldots, T)$

X_{j3t} = the dividend policy index of j^{th} firm over time period t, $(j = 1, 2, \ldots, I_k)$, $(t = 1, 2, \ldots, T)$

b_{jn} = the coefficient of the k^{th} firm related variable in the j^{th} equation, $(n = 1, 2, 3)$

β_{mj} = the coefficient of market rate of return in the j^{th} equation,

ε_{jt} = the disturbance term for j^{th} equation.

Equation (1) represents a linear relationship between the rates of return on the j^{th} security, the market rates of return and three

firm related variables. Simkowitz and Logue (1973) have assumed that there exists a structural simultaneous equation relationship for the security rate of return generating process of within each particular industry. In terms of matrix notation, S-L have defined their model as:

$$(2) \qquad \Gamma R_j^{'} = B^*X^* + \beta R_m^{'} + E$$

Where R_j ($j = 1, \ldots, n$) is a vector which represents rates of return for each of the I_k securities of the k^{th} group; Γ is an $(I_k \times I_k)$ matrix; $R_j^{'}$ is an $(I_k \times T)$ matrix; B_m is an $(I_k \times 1)$ vector; X^* is an $(nI_k \times T)$ matrix; and E is an $(I_k \times I_k)$ matrix. Further, $X^* = [X_1 \ldots. X_j \ldots. X_{Ik}]$ where X_i is an $(n \times T)$ matrix of observations of the i^{th} firm's firm-related variables; and $B^* = [b_1, b_2, \ldots, b_j, \ldots, b_{Ik}]$ where b_j is an $(I_k \times n)$ matrix of coefficients relating the X_j variables to the R_j variables.

Premultiplying equation (2) by Γ^{-1}, we have:

$$(3) \qquad R_j^{'} = \Gamma^{-1}B^*X^* + \beta'' R_m^{'} + \Gamma^{-1}E$$

Equation (3) is the matrix notation for the L-V model defined in equation (1). Now, the L-V model is compared with the S-L model defined in equation (2). The S-L model's restrictions are that E is spherical normal and B is block diagonal, while the L-V model's restrictions are that $\Gamma^{-1}E$ is spherical normal and $\Gamma^{-1}B$ is block diagonal. In sum, the L-V is simply a restatement of the S-L model with slightly different restrictions. However, Lee and Vinso have shown that the S-L approach was cumbersome and statistically inefficient. The inefficiency is essentially due to the multicollinearity and identification problems associated with structural equation systems of econometrics as shown by Klein and Nakamura (1962). It should be noted that the L-V model

has avoided this weakness and preserved most of the strengths of the S-L model. Following both S-L and L-V, it is clear that the Sharpe (1964) model is a special case of both the S-L model and the L-V model.

Rosenberg (1974) has shown that there exists extra-market components of covariance in security returns. He also indicated that there exists the problem of correlation across disturbance returns unless all possible factors affecting security rates of return are included in the model. Empirically, it is impossible to include all factors in the model, therefore, some compromised approaches should be used to improve the empirical results associated with the Sharpe model. The essence of the L-V model is to include some measurable extra-market components and to take care of the effect of other excluded components by the seemingly uncorrelated regression (SUB) method developed by Zellner (1962). Empirically, the L-V model uses the generalized least squares [GLS] method to estimate simultaneously the equation system as specified in equation (1). The usefulness of the L-V model can be illustrated by Telser's (1964) iterative estimation method for estimating a linear regression equation system.

To take care of the correlation among the disturbance terms, Telser (1964) has shown that the OLS residuals from other equations within the system can be used as regressors and the iterative method can be used to estimate the coefficients associated with the original regressors. Following the specification of equation (1), Telser's iterative specification can be defined as:

$$(4) \qquad R_{jt} = a_j + \beta_j R_m + b_{j1} X_{j1t} + b_{j2} X_{j2t} + b_{j3} X_{j3t} + C_{j1} U_{1t}(i) + C_{j2} U_2(i) + \ldots + C_{jj-1} U_{j-1}(i) + C_{jj} U_{j+1}(i) + \ldots + C_{jI_{k-1}} U_{I_k}(i) + V_{jt}$$

Where V_{jt} is the disturbance term.

Equation (4) contains two kinds of variables, the non-stochastic variables (R_m, X_{j1t}, X_{j2t} and X_{j3t}) and the random variables (U, U_2, ..., U_{j-1}, U_{j+1}, ..., U_{Ik}). Note that the random variables do not include the residuals associated with the j^{th} equation. Although we cannot observe the random variables, we do have consistent estimates of the simple OLS estimates. The i index associated with the random variables Us' represents the disturbance terms of the i^{th} round estimation. Furthermore, Telser has shown that the iterative estimates of β_j, b_{j1}, b_{j2} and b_{j3} converge th Zellner's GLS estimates. This implies that the L-V model can be used to improve the efficiency of the estimated β_j, b_{j1}, b_{j2} and b_{j3}. In sum, the estimated β_j is used to show the importance of the market information, and the estimates of b_{j1}, b_{j2} and b_{j3} are used to indicate the importance of accounting information.

III. Empirical Results and Their Implications

To test empirically the impact of different measures of "firm related variables" on security rate of return determination, annual data from the 35 largest industries during 1960-1975 are used (see Appendix Table A-1). Annual stock prices of 490 firms are used to calculate the rates of return with appropriate adjustment for both dividends and stock splits. The Standard and Poor's 500 (S & P) index is used to calculate the annual market rate of return. Following Simkowitz and Logue, the leverage index is defined as the annual change of long-term debt plus the annual change of outstanding preferred stock divided by total assets; the dividend policy index is defined as the annual change of total dividends divided by the book value of equity.

To investigate the impact of alternative accounting income measures on the market equity rates of return the following six accounting based variables were used: (A) Total Asset Turnover, (B) Gross Return on Total Assets, (C) Net Return on Total Assets, (D) Return on Common Equity, (E) Gross Profit Margin; and (F) Net Profit Margin. Each of these six variables were used in turn as the profitability index in equation (1). While Sales/Total Assets is typically referred to as a turnover or activity ratio, it is included here to aid in the analysis of the sales vs. income maximization issue.

The explanatory power of alternative income measures on the annual equity rates of return will shed some light to accountants and financial analysts as to the relative importance of different income information disclosure.

Baumol (1961, Chapter 10) has suggested that managers generally maximize either sales or profit.[1] Alternative profitability indices used in this study will show individual company's manager whether he should attempt to maximize either sales, profit or some combination of the two.

Based upon the specification of equation (1), the OLS was used to estimate the related parameters for individual firms. Thirty-five residual correlation coefficient matrices are estimated for each of the 35 industries. Because it was found that the residuals within the industry were generally highly correlated, Zellner's SUR method was used to estimate simultaneously all the equations within an industry.

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[1]Sale maximization is not necessarily equivalent to profit maximization since a manager may sacrifice profits to increase sales.

Due to the large number of firms in several of the industries, Zellner's GLS could not be directly applied to obtain efficient estimators. Under this circumstance, cluster analysis was used to classify the firms into several appropriate sub-groups.[2] Zellner's GLS method was then used to obtain efficient estimators within each sub-group.

The metal mining industry is used as an example to show how the L-V model can be used to analyze the impacts of alternative firm related variables on security rate of return determination. (A second industry example is presented in Appendices A-2 through A-4.) First the return on equity is used as the profitability index and the OLS is used to estimate the L-V model. The results are presented in Table I. As can be seen, the income variable, NI/CEq, is significant for 3 of the 9 firms at the .05 level. The leverage and dividend variables are significant for 3 and 2 of the 9 firms, respectively. The coefficient indicating the importance of market information, β_j, is significant for 5 of the firms.

Because of the probability of interrelationships among the variables, the OLS residuals were examined. A 9 x 9 residual correlation coefficient matrix was calculated and the results are presented in Table II. Using Fisher's Z test, it was found that 14 of the 36 residual correlation coefficients were significantly different from zero at the .05 level. This implies that Zellner's SUR method can be used to obtain more efficient estimates than those of the OLS procedure.

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[2]Farrell (1974) has used the cluster analysis technique to obtain homogenous stock groupings.

The SUR results associated with these 9 firms are listed in Table III. From the empirical results in Table III, it is found that 6 out of 9 regression coefficients associated with market rates of return were significantly different from zero at the .05 level. With respect to the coefficients related to accounting based variables, 5 regression coefficients associated with the profitability index, 5 coefficients associated with the leverage index and 4 coefficients associated with the dividend policy index were significantly different from zero at the .05 level. These results imply that there exist some extra-market components for the metal mining industry as demonstrated by Rosenberg (1974). The sign of the regression coefficients associated with each firm related variables must also be analyzed. All of the significant coefficients of the income variables are positive; indicating that higher reported return on common equity will result in higher investor returns. However, if there exists an optimum dividend policy and an optimum capital structure within an industry, the regression coefficients associated with the dividend policy index and the leverage index can be either positive or negative.[3] Of the 5 significant leverage coefficients, one is negative and of the 4 significant dividend coefficients, 3 are negative.[4]

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[3]If a firm has reached its optimal leverage ratio, an increase of debt will reduce the value of a firm and the sign associated with leverage index will be negative. A similar argument can be used to determine the sign associated with the dividend policy index.

[4]For the entire 490 firms, 49.4% of the significant leverage coefficients and 72.6% of the significant dividend coefficients were negative. See Table V for a summary.

In addition to the return on equity, similar procedures were utilized for each of the other five profitability measures.[5] (A summary comparison of two clustered and two non-clustered industries is presented in Appendices A-5 and A-6.)

The results of using different profitability measures are presented in Tables IVa-IVc. As can be seen the regression coefficient associated with different profitability measures were significant for different companies. For example, the Sales/TA and EBIT/TA coefficients are both significant for 5 firms, but not the same 5 firms. (Only three firms have both measures significant.) Furthermore, the gross profit margin, EBDT/Sales, was significant in only two instances. Also of interest is the fact that one firm, Cleveland-Cliffs Iron Co., exhibited a significant negative correlation coefficient when EBIT/TA was utilized as the profitability measure. Theoretically, the negative relationship between market rates of return and the over-all accounting rates of return measure is hardly justified. One possible explanation is that an increase in an over-all accounting rate of return does not necessarily imply an increase in earning per share.[6]

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[5]Ball and Brown (1968) has used the relationship between the residual of the market model and the net income number to evaluate the importance of accounting information disclosure to the value of the security. Our model can be used as an alternative for Ball and Brown's model. One of the strengths of our model is the consideration of the relationship of individual firms within an industry simultaneously.

[6]A similar explanation has been used by Boness and Frankfurter (1977) to justify why the equity value of electric utilities is negatively related to the asset growth rate for some time periods.

It may also be observed that the different profitability measures have little impact on the relationship between market return and the return on the individual security. The same six firms exhibited significant market return coefficients for each of the alternative profitability measures. This implies that the earnings measures are relatively orthogonal to the market returns.

Similar results are not observed when the coefficients of the leverage and dividend variables are examined. As alternative profitability measures are used in the regression procedure, different companies exhibit significant regression coefficients for the leverage and/or dividend measures. This implies that the impact of financing and/or dividend policies on alternative return measures is not necessarily identical.

An examination of the correlation coefficients among the market rate of return, the profitability index, the leverage index and the dividend policy index, revealed that the problem of multicollinearity associated with the multi-index model used in this study is relatively trivial.[7]

All 35 industries were examined in a similar manner, and the aggregated results are presented in Table V. For five out of the six profitability measures, the regression coefficients indicated a significant relationship existed at the .05 level for approximately 50 percent of the firms. The sixth profitability measure, Sales/Total Assets, exhibited significance for 35.9 percent of the firms. The proportion

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[7]Aber (1973) has shown that the multicollinearity problems associated with most multi-index models are generally non-negligible.

of significantly negative profitability coefficients to the total significant profitability coefficients ranged from a low of 15.0 percent (37/246) for EBIT/TA to a high of 24.3 percent (57/235) for EBIT/Sales. The over-all rates of return vs. the earning per share justification (see footnote 6) cannot be used to explain the negative value associated with the net income/common equity measure. It is found that the negative coefficients for this measure is essentially due to the strong relationship between the profitability measure and the dividend policy measure. As return on equity and dividend pay-out with respect to equity have the same denominator and their numerators (Net income and dividends) generally move together, there exists a good chance for NI/equity to be highly correlated with the dividend policy index. On examination it is found that the regression coefficient of NI/CEq was significant and negative when the two measures were strongly negatively correlated.

Generally, between 40 and 50 percent of the significant leverage coefficients were negative and between 65 and 75 percent of the significant dividend coefficients were negative. These results suggest that optimal leverage and dividend policies exist on an industry basis (see footnote 3).

While the aggregation shows that accounting income information has a significant impact on the return of a security, closer examiniation reveals the impact is not uniform across industries, but that some industries show a stronger relationship than others. This is presented in Table VI. In this table the proportion of significant regression coefficients for the profitability measures are presented for each of the 35 industries. It may be observed that some industries exhibit little or no relationship

between the profitability measure and the return on the security while other industries show a substantial proportion of the firms do exhibit a relationship. For example, none of the 3 firms in the Heavy Construction Contractor Industry (SIC code 16) show any significant profitability regression coefficients while the Printing and Publishing Industry (SIC code 27) has 50 to 90 percent of the firms showing a significant relationship, depending on the profitability measure used.

The relative importance of profitability measure with respect to different industry is now analyzed. For the Heavy Constructor and the Oil and Gas Extraction industries' earnings fluctuation are relatively consistent with the fluctuation of market rates of return, hence profitability is not an important extra market component. In addition, since annual accounting information is relatively easily integrated with annual market information [see Ball and Brown], it is not unreasonable to expect that either quarterly or monthly accounting information will have stronger impact on the determination of market equity rates of return than will annual accounting information.

In comparing the impact of alternative accounting income measures on the capital asset pricing, it is found that Sales/TA is not as important as profitability indices derived from net income. This kind of findings sheds some light on the sales maximization vs. profit maximization argument. These findings indicate investors generally prefer profit maximization to sale maximization. Besides Sales/TA and NT/equity, it is concluded that either EBIT/TA or NI/TA is the most desirable profitability index to be used as one of the extra-market components to improve the capital asset pricing.

IV. Summary and Concluding Remarks

Based upon an efficient estimation model for capital asset pricing developed by Lee and Vinso (1976), the importance of accounting information in capital asset pricing is empirically demonstrated. Furthermore, six alternative profitability measures are used to show a manager should generally use either a profit maximization or a sales maximization strategy depending on which measure has the most favorable impact on the firm's security rate of return.

Annual data associated with 35 industries (490 firms) are used for the empirical studies. It is found that accounting information is important complementary information for capital asset pricing. It is also found that generally investors prefer a profit maximization strategy to a sale maximization strategy. Finally, quarterly accounting information will be used to test the importance of accounting information in capital asset pricing in the future research. In addition, the advantage of the model used in this study relative to Ball and Brown's model in testing the importance of accounting information for capital asset pricing will also be explored in the near future.

TABLE I

ESTIMATES OF REGRESSION COEFFICIENTS
USING AN ORDINARY LEAST SQUARES PROCEDURE:
THE ACCOUNTING PROFITABILITY MEASURE IS NET INCOME/COMMON EQUITY

Industry Name Metal Mining
Industry Code 10
Number of Firms 9

	Company	Constant	NI/CEq	Leverage	Dividends	Rm
1.	Amax, Inc.	1.315 (2.305)*	1.829 (.744)	-1.512 (-2.074)*	-15.833 (-2.642)*	1.793 (2.955)**
2.	Asarco, Inc.	-.419 (-1.001)	3.479 (1.151)	1.816 (.901)	-.845 (-.162)	1.690 (2.270)*
3.	Cleveland-Cliffs Iron Co.	-.490 (-.902)	-.491 (-.059)	-1.443 (-.915)	21.668 (.947)	1.174 (1.708)
4.	Foote Mineral Co.	-.371 (-1.447)	8.341 (2.701)*	-1.008 (-2.012)*	5.931 (1.068)	.039 (-.031)
5.	Inco, Ltd.	.186 (.376)	2.676 (1.268)	-.743 (1.081)	5.453 (-1.112)	1.239 (2.081)*
6.	Texasgulf, Inc.	.827 (1.409)	-1.362 (-.643)	-.367 (-.279)	-.866 (-1.169)	1.171 (1.049)
7.	Cominco, Ltd.	-.379 (-1.186)	.342 (.105)	1.086 (1.304)	3.111 (.482)	1.644 (2.897)**
8.	Hudson Bay Mining and Smelting	-.493 (-2.315)*	2.004 (1.914)*	1.876 (2.065)*	1.640 (.605)	1.605 (4.605)**
9.	Homestake Mining	-.392 (-1.171)	1.133 (4.183)**	2.305 (1.122)	-15.804 (-3.730)**	1.657 (1.645)

Remarks: t-values appear in parentheses.
* indicates significance at .05 level.
** indicates significance at .01 level.

TABLE II

RESIDUAL CORRELATION MATRIX
FOR THE METAL MINING INDUSTRY
WITH NET INCOME/COMMON EQUITY AS THE PROFITABILITY VARIABLE

	1	2	3	4	5	6	7	8	9
1	1.000	.241	.306	-.311	.459	.320	.500*	.433	.531*
2		1.000	.718*	-.016	-.185	.156	.706*	.527*	.464
3			1.000	-.062	.081	.304	.592*	.584*	.602*
4				1.000	-.588*	.209	-.088	-.512*	-.203
5					1.000	.148	-.121	.212	.219
6						1.000	.393	-.052	.548*
7							1.000	.623*	.539*
8								1.000	.511*
9									1.000

* Indicates significance at the .05 level.

TABLE III

ESTIMATES OF REGRESSION COEFFICIENTS USING
THE SEEMINGLY UNRELATED REGRESSION PROCEDURE:
THE ACCOUNTING PROFITABILITY MEASURE IS NET INCOME/COMMON EQUITY

Industry Name: Metal Mining
Industry Code: 10
Number of Firms: 9

	Company	Constant	NI/CEq	Leverage	Dividend	Rm
1.	Amax, Inc.	1.164 (2.795)**	.004 (.022)	-1.096 (-2.068)*	-11.235 (-2.587)**	1.493 (2.719)**
2.	Asarco, Inc.	-.742 (-2.657)**	3.996 (2.174)*	2.674 (2.071)*	2.395 (.737)	1.714 (2.605)**
3.	Cleveland-Cliffs Iron Co.	-.649 (-1.914)*	4.109 (.812)	-1.031 (-1.051)	11.514 (.800)	1.221 (1.886)*
4.	Foote Mineral Co.	-.481 (-2.347)*	8.355 (3.872)**	-.586 (-1.600)	5.553 (1.484)	-.002 (-.002)
5.	Inco, Ltd.	1.063 (.304)	3.404 (2.645)**	-.476 (-.844)	-6.118 (-1.830)*	1.412 (2.798)**
6.	Texasgulf, Inc.	.592 (1.539)	-.068 (-.050)	-.083 (-.100)	8.833 (-1.927)*	1.474 (1.441)
7.	Cominco, Ltd.	-.331 (-1.879)*	-.388 (-.225)	1.164 (2.357)*	3.597 (1.093)	1.604 (3.045)**
8.	Hudson Bay Mining and Smelting	-.441 (-3.476)**	2.302 (3.827)**	1.809 (3.484)**	.611 (.365)	1.668 (5.397)**
9.	Homestake Mining	-.244 (-1.036)	9.802 (5.708)**	2.479 (3.439)**	-15.574 (-5.528)**	1.271 (1.371)

Remarks: t-values appear in parantheses.
* indicates significance at .05 level.
** indicates significance at .01 level.

TABLE IV a

ESTIMATES OF REGRESSION COEFFICIENTS USING SEEMINGLY UNRELATED REGRESSION PROCEDURE: ACOUNTING VARIABLES ARE SALES/TA AND EBIT/TA

Industry Name: Metal Mining
Industry Code: 10
Number of Firms: 9

	(A)					(B)				
Company	Constant	Sales/TA	Leverage	Dividends	Rmkt	Constant	EBIT/TA	Leverage	Dividends	Rmkt
Amax, Inc.	1.348 (3.535)**	.104 (.735)	-1.242 (-2.011)*	-14.811 (-3.461)**	1.565 (3.106)**	1.034 (2.463)**	1.832 (.722)	-.800 (-1.295)	-12.668 (-3.297)**	1.606 (3.237)**
Asarco, Inc.	-.844 (-2.582)**	.546 (2.154)*	1.359 (1.235)	4.594 (1.918)*	1.131 (1.824)*	-.458 (-2.068)*	.676 (.509)	1.779 (1.712)*	5.768 (2.398)**	1.161 (1.871)*
Cleveland-Cliffs Iron Co.	-.500 (-1.123)	-.726 (-.720)	-1.436 (-1.843)*	28.937 (3.017)**	1.120 (1.712)*	-.038 (-.139)	-23.243 (-5.083)**	-6.596 (-6.165)**	64.184 (7.300)**	1.725 (2.992)**
Foote Mineral Co.	-3.244 (-4.690)**	3.293 (4.917)**	.597 (1.517)	9.988 (3.006)**	-.671 (-.749)	-.741 (-3.182)**	9.927 (4.542)**	.351 (.924)	6.125 (1.755)*	.089 (.058)
Inco, Ltd.	-1.232 (-2.472)**	2.051 (3.599)**	1.015 (1.412)	-.169 (-.058)	1.342 (2.916)**	-.041 (-.110	2.986 (2.393)**	.295 (.404)	-4.882 (-1.398)	1.255 (2.520)**
Texasgulf, Inc.	.287 (.552)	-.002 (-.020)	.287 (.359)	-3.619 (-.778)	1.550 (1.563)	.370 (.951)	.127 (.083)	-.121 (-1.39)	-4.432 (-.951)	1.505 (1.518)
Cominco, Ltd.	-.687 (-4.007)**	1.134 (2.790)**	-.004 (-.057)	.288 (.146)	1.938 (3.939)**	-.330 (-1.870)*	1.125 (.870)	1.065 (2.049)*	1.355 (.492)	1.680 (3.297)**
Hudson Bay Mining and Smelting	-.332 (-1.933)*	-1.136 (-1.599)	2.886 (3.740)**	9.707 (2.938)**	1.105 (3.272)**	-.377 (-2.753)**	3.680 (3.699)**	1.994 (3.360)**	-2.459 (-1.057)	1.546 (4.924)**
Homestake Mining	-1.594 (-3.862)**	3.290 (5.524)**	4.376 (4.823)**	-6.426 (-2.990)**	.873 (.906)	.007 (.272)	4.420 (3.475)**	2.407 (3.112)**	-7.780 (-2.994)**	.764 (.680)

Remarks: t-values appear in parentheses beneath the corresponding coefficients.

* indicates significance at .05 level.

** indicates significance at .01 level.

TABLE IV b

ESTIMATES OF REGRESSION COEFFICIENTS USING SEEMINGLY UNRELATED REGRESSION PROCEDURE: ACCOUNTING VARIABLES ARE NI/TA AND NI/CEq

Industry Name: Metal Mining
Industry Code: 10
Number of Firms: 9

Company	(C) Constant	(C) NI/TA	(C) Leverage	(C) Dividends	(C) Rmkt	(D) Constant	(D) NI/CEq	(D) Leverage	(D) Dividends	(D) Rmkt
Amax, Inc.	1.355 (2.851)**	-2.751 (-.775)	-1.459 (-2.072)*	-9.260 (-2.045)*	1.327 (2.473)**	1.164 (2.795)**	.004 (.022)	-1.096 (-2.068)*	-11.235 (-2.587)**	1.493 (2.719)**
Asarco, Inc.	-.742 (-2.693)*	6.928 (2.567)**	2.788 (2.195)*	.374 (.106)	1.813 (2.776)**	-.742 (-2.657)**	3.996 (2.174)*	2.674 (2.071)*	2.365 (.737)	1.714 (2.605)**
Cleveland-Cliffs Iron Co.	-1.051 (-2.477)**	11.289 (1.611)	.489 (.362)	4.545 (.359)	1.133 (1.757)*	-.649 (-1.914)*	4.109 (.812)	-1.031 (-1.951)	11.514 (.800)	1.271 (.1866)*
Foote Mineral Co.	-.734 (-2.975)**	17.184 (4.975)**	.330 (.834)	6.069 (1.506)	-.226 (-.222)	-.481 (-2.347)*	8.353 (3.872)**	-.586 (-1.600)	5.553 (1.464)	-.002 (-.002)
Inco, Ltd.	.287 (.763)	4.547 (2.389)*	.235 (.310)	-8.230 (-2.328)*	1.137 (2.315)*	1.083 (.304)	3.404 (2.645)**	-.476 (-.844)	-6.118 (-1.830)*	1.412 (2.798)**
Texasgulf, Inc.	.606 (1.460)	-.005 (-.021)	-.100 (-.116)	-9.181 (-1.898)*	1.480 (1.463)	.592 (1.539)	-.068 (-.050)	-.083 (-.100)	8.833 (-1.927)*	1.474 (1.441)
Cominco, Ltd.	-.300 (-1.701)*	-1.122 (-.478)	.832 (1.255)	4.210 (1.560)	1.637 (3.068)**	-.331 (-1.879)*	-.388 (-.275)	1.164 (2.357)*	3.597 (1.093)	1.604 (3.045)**
Hudson Bay Mining and Smelting	-.506 (-3.616)**	3.143 (2.821)**	2.752 (4.151)**	.639 (.322)	1.405 (4.494)**	-.441 (-3.476)**	2.307 (3.827)**	1.809 (3.484)**	.611 (.365)	1.668 (5.397)**
Homestake Mining	-.283 (-.962)	10.269 (3.936)**	3.199 (3.291)**	-12.446 (-3.898)**	1.099 (1.038)	-.244 (-1.036)	9.802 (5.708)**	2.479 (3.439)**	-15.574 (-5.528)**	1.271 (1.371)

Remarks: t-values appear in parentheses beneath the corresponding coefficients.

* indicates significance at .05 level.

** indicates significance at .10 level.

TABLE IV c

ESTIMATES OF REGRESSION COEFFICIENTS USING SEEMINGLY UNRELATED REGRESSION PROCEDURE: ACCOUNTING VARIABLES ARE EBDT/SALES AND NI/SALES

Industry Name: Metal Mining
Industry Code: 10
Number of Firms: 9

(E)

Company	Constant	EBDT/Sales	Leverage	Dividends	Rmkt
Amax. Inc.	1.903 (3.576)**	-2.191 (-1.373)	-1.827 (2.309)*	-15.570 (-3.723)**	1.562 (3.111)**
Asarco, Inc.	-.626 (-2.157)*	2.356 (1.023)	1.731 (1.280)	6.012 (1.964)*	1.222 (1.963)*
Cleveland-Cliffs Iron Co.	-.317 (-1.[illegible])	-1.[illegible] (-.677)	-2.2[illegible] (-2.7[illegible])**	[illegible] (3.379)**	1.275 (1.356)*
Foote Mineral Co.	-.558 (-1.[illegible])	[illegible] (1.[illegible])	1.283 (.[illegible])	8.130 (1.[illegible])*	-1.463 (-1.[illegible])
Inco, Ltd.	.[illegible] (.[illegible])	1.[illegible] (1.[illegible])	-.32[illegible] (-.536)	[illegible] (-1.149)	1.[illegible] (2.05[illegible])*
Texasgulf, Inc.	.534 (1.399)	-.773 (-.895)	-.036 (-.054)	-1.778 (-.457)	1.255 (1.218)
Cominco, Ltd.	-.213 (-.625)	-1.269 (-.935)	.882 (1.327)	6.233 (2.772)**	1.784 (3.357)**
Hudson Bay Mining and Smelting	-.952 (-6.200)**	2.276 (4.526)**	2.377 (4.596)**	1.154 (.824)	1.552 (5.316)**
Homestake Mining	-.159 (-.719)	4.578 (5.141)**	2.324 (3.904)**	-10.259 (-3.846)**	.530 (.492)

(F)

Company	Constant	NI/Sales	Leverage	Dividends	Rmkt
Amax. Inc.	1.143 (2.569)**	-1.491 (-.886)	-.770 (-1.5[illegible]2)	-10.079 (-2.[illegible])**	1.398 (2.[illegible])**
Asarco, Inc.	.894 (-2.084)*	5.996 (1.796)*	2.679 (1.750)*	.784 (.206)	(1.785) (2.593)**
Cleveland-Cliffs Iron Co.	-1.[illegible]7 (-3.[illegible])**	[illegible] (3.201)*	-.[illegible] (-.[illegible])	[illegible] (2.[illegible])**	1.[illegible] (1.[illegible])
Foote Mineral Co.	-.576 (-1.[illegible])*	13.145 ([illegible])*	.255 (.[illegible])	6.923 ([illegible].227)	-1.[illegible] (-.810)
Inco, Ltd.	.[illegible] (.705)	.75[illegible] (.[illegible])	-.[illegible] (-1.[illegible])	[illegible] (-.[illegible])	.[illegible] (1.67[illegible])*
Texasgulf, Inc.	.916 (1.852)*	-1.634 (-.896)	-.166 (-.133)	-8.370 (-1.669)*	1.143 (1.145)
Cominco, Ltd.	-.008 (-.355	-1.853 (-1.341)	.272 (.203)	[illegible] (2.415)**	1.723 (3.776)**
Hudson Bay Mining and Smelting	-.760 (-5.178)**	2.128 (3.564)**	3.265 (4.807)**	2.302 (1.624)	1.493 (5.261)**
Homestake Mining	-.328 (-.880)	7.405 (2.734)**	1.882 (2.141)*	-13.483 (-3.068)**	.187 (.247)

Remarks: t-values appear in parentheses beneath the corresponding coefficients.

* indicates significance at .05 level.

** indicates significance at .01 level.

TABLE V

A SUMMARY OF THE SIGNIFICANT REGRESSION COEFFICIENTS FOR SIX ALTERNATIVE INCOME MEASURES FOR 490 COMPANIES

Variable	Level of Significance .01	Level of Significance .05	Variable	Level of Significance .01	Level of Significance .05
Sales/TA	119	176	NI/TA	184	251
	(20)[a]	(37)		(30)	(39)
Leverage[b]	107	175	Leverage	125	189
	(49)	(88)		(53)	(78)
Dividends[c]	107	175	Dividends	133	196
	(69)	(113)		(96)	(138)
Rm[d]	144	284	Rm	147	276
					(1)
	(A)			(B)	
EBIT/TA	173	246	NI/CEq	174	244
	(22)	(37)		(34)	(45)
Leverage	117	171	Leverage	104	172
	(49)	(62)		(56)	(85)
Dividends	124	196	Dividends	121	201
	(91)	(144)		(99)	(146)
Rm	154	283	Rm	156	288
	(C)			(D)	
EBDT/Sales	152	235	NI/Sales	133	244
	(35)	(57)		(26)	(38)
Leverage	124	193	Leverage	122	193
	(65)	(94)		(58)	(87)
Dividends	139	194	Dividends	132	205
	(85)	(134)		(89)	(134)
Rm	145	259	Rm	139	260
					(1)
	(E)			(F)	

(a) Significant negative coefficients are in parentheses.

(b) Leverage = (Long Term Debt + Preferred Stock)/Total Assets

(c) Dividends = Common Stock Dividends/Common Stock Equity

(d) Rm = Return on S & P 500

TABLE VI

THE PROPORTION OF PROFITABILITY MEASURES WITH REGRESSION COEFFICIENTS SIGNIFICANT AT THE .05 LEVEL FOR EACH OF THE 35 INDUSTRIES USING THE SEEMINGLY UNRELATED REGRESSION PROCEDURE

2-Digit SIC Code	Number of Firms	Sales/TA	EBIT/TA	NI/TA	NI/CEq	EBIT/Sales	NI/Sales
10	9	.556	.556	.556	.556	.222	.556
12	4	.250	.500	.500	.500	.250	.750
13	3	.333	.333	.333	.333	.000	.333
16	3	.000	.000	.000	.000	.000	.000
20	38	.342	.474	.395	.447	.474	.500
21	7	.143	.714	.143	.714	.286	.143
22	9	.556	.333	.333	.333	.667	.444
23	9	.333	.333	.333	.333	.222	.444
24	7	.429	.286	.286	.286	.286	.429
25	3	.333	.333	.333	.333	.333	.333
26	16	.375	.813	.563	.625	.625	.563
27	10	.500	.800	.700	.700	.900	.700
28	59	.492	.593	.644	.576	.508	.458
29	28	.429	.429	.571	.607	.464	.571
30	12	.333	.667	.750	.500	.833	.667
31	3	.000	.333	.333	.333	.667	.667
32	20	.500	.700	.650	.800	.600	.600
33	32	.406	.531	.656	.688	.469	.594
34	17	.294	.294	.294	.353	.176	.176
35	42	.262	.524	.524	.452	.548	.595
36	27	.407	.556	.556	.593	.593	.519
37	34	.294	.559	.529	.588	.559	.471
38	15	.600	.400	.400	.400	.333	.267
39	8	.000	.250	.250	.250	.250	.125
42	3	.333	.000	.333	.333	.333	.000
45	12	.333	.583	.583	.667	.583	.750
48	7	.000	.429	.143	.286	.143	.429
50	2	.000	1.000	.000	1.000	.500	1.000
51	4	.000	.500	.000	.250	.250	.250
53	17	.235	.471	.588	.294	.471	.471
54	11	.364	.636	.636	.545	.727	.545
56	4	.250	.250	.500	.500	.500	.250
59	5	.600	.400	.400	.400	.400	.200
78	2	.500	1.000	1.000	.500	1.000	1.000
99	8	.000	.250	.500	.250	.250	.375
Overall:	490	.359	.502	.512	.498	.480	.492
Negative / Overall :		.210	.155	.150	.184	.243	.156

APPENDIX

TABLE A-1

Industry Listing

2-Digit SIC Code	Industry Title	Number of Firms
10	Metal Mining	9
12	Bituminous Coal and Lignite Mining	4
13	Oil and Gas Extraction	3
16	Heavy Construction Contractors	3
20	Food and Kindred Products	38*
21	Tobacco Manufactures	7
22	Textile Mill Products	9
23	Apparel and Other Textile Products	9
24	Lumber and Wood Products	7
25	Furniture and Fixtures	3
26	Paper and Allied Products	16*
27	Printing and Publishing	10
28	Chemicals and Allied Products	59*
29	Petroleum and Coal Products	28*
30	Rubber and Misc. Plastics Products	12
31	Leather and Leather Products	3
32	Stone, Clay, and Glass Products	20*
33	Primary Metal Industries	32*
34	Fabricated Metal Products	17*
35	Machinery, Except Electrical	42*
36	Electric and Electronic Equipment	27*
37	Transportation Equipment	34*
38	Instruments and Related Products	15*
39	Miscellaneous Manufacturing Industries	8
42	Trucking and Warehousing	3
45	Transportation By Air	12
48	Communication	7
50	Wholesale Trade - Durable Goods	2
51	Wholesale Trade - Nondurable Goods	4
53	General Merchandize Stores	17*
54	Food Stores	11
56	Apparel and Accessory Stores	4
59	Miscellaneous Retail	5
78	Motion Pictures	2
99	Nonclassifiable Establishments	8

* Indicates the clustering procedure was utilized.

APPENDIX

TABLE A-2

ESTIMATES OF REGRESSION COEFFICIENTS
USING AN ORDINARY LEAST SQUARES PROCEDURE:
THE ACCOUNTING PROFITABILITY MEASURE IS NET INCOME/COMMON EQUITY

Industry Name Miscellaneous Manufacturing Industries
Industry Code 39
Number of Firms 8

	Company	Constant	NI/CEq	Leverage	Dividends	Rm
1.	AMF Inc.	8.183 (2.292)*	-14.180 (- 1.260)	1.855 (.801)	-86.121 (- 2.243)*	2.217 (1.782)
2.	Brunswick Corp.	1.583 (1.829)*	-1.794 (- .444)	-4.132 (-1.744)	-15.380 (- 1.229)	.632 (.435)
3.	Eagle-Picher Inds.	2.203 (1.107)	6.602 (.671)	.293 (.142)	-50.761 (- 1.523)	2.078 (2.444)*
4.	GAF Corp.	.043 (.046)	1.732 (.111)	- .436 (-.284)	1.592 (.143)	1.479 (1.377)
5.	Insilco Corp.	.280 (.994)	-1.963 (-.505)	1.960 (2.886)**	-6.021 (-4.158)**	1.347 (2.945)**
6.	Ronson Corp.	.765 (.945)	2.492 (.577)	-2.649 (-1.093)	-4.116 (-.308)	1.960 (1.784)
7.	Starrett (L.S.) Co.	.143 (.410)	2.969 (1.026)	.946 (.906)	-6.753 (- .665)	.876 (1.449)
8.	U. S. Inds.	.103 (.100)	7.067 (1.059)	-.333 (-.066)	-8.148 (-.710)	3.036 (1.957)*

Remarks: t-values appear in parentheses.
* indicates significance at .05 level.
** indicates significance at .01 level.

APPENDIX

TABLE A-3

RESIDUAL CORRELATION MATRIX FOR THE MISCELLANEOUS MANUFACTURING INDUSTRY WITH NET INCOME/COMMON EQUITY AS THE PROFITABILITY VARIABLE

	1	2	3	4	5	6	7	8
1	1.000	.404	.688*	.712*	.321	.864*	.289	.471*
2		1.000	.324	.519*	.108	.388	.823*	.433
3			1.000	.535*	.208	.537*	.201	.831*
4				1.000	.224	.486*	.387	.386
5					1.000	.066	.031	-.049
6						1.000	.232	.516*
7							1.000	.434
8								1.000

* Indicates significance at the .05 level.

APPENDIX

TABLE A-4

ESTIMATES OF REGRESSION COEFFICIENTS USING THE
SEEMINGLY UNRELATED REGRESSION PROCEDURE: THE
ACCOUNTING PROFITABILITY MEASURE IS NET INCOME/COMMON EQUITY

Industry Name: Miscellaneous Manufacturing Industries
Industry Code: 39
Number of Firms: 8

	Company	Constant	NI/CEq	Leverage	Dividends	Rm
1.	AMF Inc.	5.981 (2.213)*	.257 (.030)	1.065 (.625)	-68.328 (-2.422)**	1.742 (1.490)
2.	Brunswick Corp.	2.257 (4.573)**	-3.566 (-1.598)	-6.179 (-4.791)**	-17.431 (- 2.212)*	.314 (.226)
3.	Eagle-Picher Inds.	.788 (.620)	9.528 (1.413)	.352 (.258)	-27.265 (-1.297)	1.995 (2.545)**
4.	GAF Corp.	.055 (.081)	-1.321 (- .119)	.067 (-.056)	1.641 (.184)	1.605 (1.512)
5.	Insilco Corp.	.234 (.890)	-.723 (-.202)	1.531 (2.623)**	-5.019 (-4.000)**	1.341 (2.937)**
6.	Ronson Corp.	.966 (2.919)**	4.204 (2.849)**	-2.474 (-2.399)**	-12.462 (-2.498)**	1.976 (1.892)*
7.	Starrett (L.S.) Co.	.198 (.668)	3.030 (1.355)	.149 (.184)	-7.364 (-.925)	.912 (1.533)
8.	U. S. Inds.	.422 (1.197)	7.427 (4.110)**	-2.442 (-1.650)	-3.789 (-.897)	3.186 (2.122)*

Remarks: t-values appear in parentheses.
* indicates significance at .05 level.
** indicates significance at .01 level.

TABLE A-[illegible]

A COMPARISON OF [illegible] REGRESSION
COEFFICIENTS FOR TWO NON-CLUSTERED INDUSTRIES

Industry Name	Metal Mining		Miscellaneous Manufacturing	
Industry Code	10		39	
Number of Firms	9		8	
Variables	Level of Significance		Level of Significance	
	.01	.05	.01	.05
Sales/TA	5	5	0	0
Leverage	2	4 (2)	2 (1)	3 (1)
Dividends	5 (2)	6 (2)	2 (2)	4 (4)
Rm	4	6	2	5
EBIT/TA	5 (1)	5 (1)	2	2
Leverage	3	5	3 (2)	3 (2)
Dividends	4 (2)	5 (2)	4 (4)	5 (5)
Rm	5	6	2	3
NI/TA	4	5	2	2
Leverage	2	4 (1)	3 (2)	3 (2)
Dividends	1 (1)	4 (3)	3 (3)	4 (4)
Rm	4	6	2	4
NI/CEq	4	5	2	2
Leverage	2	5 (1)	3 (2)	3 (2)
Dividends	2 (2)	4 (4)	3 (3)	4 (4)
Rm	5	6	2	4
EBDT/Sales	2	2	1	2
Leverage	3 (1)	4 (2)	3 (2)	3 (2)
Dividends	4 (2)	6 (2)	2 (2)	2 (2)
Rm	3	6	2	4
NI/Sales	2	5	0	1
Leverage	1	3	2 (2)	3 (2)
Dividends	4 (2)	5 (3)	2 (2)	5 (5)
Rm	4	6	2	4

APPENDIX

TABLE A-6

[illegible]

Industry Name	[illegible] and Kindred Products		Machinery, Except Electrical	
Industry Code	[illegible]		35	
Number of Firms	38		47	
Variables	**Level of Significance**		**Level of Significance**	
	.01	.05	.01	.05
Sales/TA	8 (1)	13 ([illegible])	8 (2)	11 ([illegible])
Leverage	9 ([illegible])	13 (5)	4 (2)	8 (5)
Dividends	8 ([illegible])	13 (11)	7 (5)	14 (10)
Rm	11	17	19	31
EBIT/TA	13	18	17 (2)	22 ( )
Leverage	6 (1)	11 (2)	9 (6)	13 (6)
Dividends	6 (6)	14 (14)	12 (11)	17 (15)
Rm	10	18	19	32
NI/TA	13 (1)	15 (1)	13 (1)	22 (2)
Leverage	9 (3)	12 (5)	10 (5)	15 (8)
Dividends	12 (12)	16 (15)	11 (10)	21 (14)
Rm	9	16	20	34 (1)
NI/CEq	14 (2)	17 (2)	12 (2)	19 (2)
Leverage	9 (4)	12 (6)	6 (3)	13 (6)
Dividends	11 (10)	17 (16)	10 (8)	17 (14)
Rm	9	18	18	33 (1)
EBDT/Sales	11 (3)	18 (4)	17 (3)	23 (3)
Leverage	8 (3)	11 (4)	10 (5)	15 (8)
Dividends	15 (13)	19 (17)	12 (8)	20 (14)
Rm	10	17	18	33 (1)
NI/Sales	15 (4)	19 (4)	16	25 (2)
Leverage	7 (2)	13 ([illegible])	11 (5)	19 (8)
Dividends	[illegible]1 ([illegible])	[illegible] ([illegible])	10 ([illegible])	18 (1[illegible])
Rm	[illegible]	15	1[illegible]	3[illegible] (1)

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